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### Feature Article

## Air Defense Planning Aided by Simulations

by Sandra I. Erwin

War-planning software currently in development for Navy Aegis cruisers will give air defense planners at sea—via digital simulations—a capability to try to predict how their proposed layout of forces would affect the outcome of the battle.

The system is called the area air defense commander (AADC), a program that started in 1998. It automates air defense planning—a task that traditionally has been accomplished with paper and pencil. AADC produces a digital, 3-D picture of the battlefield, which expedites the process of conducting “what-if” scenarios for air defense.



AADC is a command and control system that uses data received from other sensors to develop alternative solutions for placing blue forces in the theater. The air defense commander tool allocates resources and does not manage individual engagements.

There are three prototypes being tested today. The Navy plans to install AADC on 12 ships by 2006, as part of an overall upgrade program for the Aegis cruisers.

One of the prototypes is at the Johns Hopkins University Applied Physics Lab, in Laurel, Md., where the system first was developed. The other two systems are being demonstrated on the USS Shiloh and the USS Mount Whitney.

“The warfare area commander function in the past was done manually with pencils,” said Navy Cdr. Dean M. Pedersen, AADC program manager. “The system that we are building automates those functions and gives [the commander] better information,” he said, during a conference on naval theater ballistic missile defense in Columbia, Md.

theater ballistic missile defense, in Columbia, Md.

The main reason the Navy is trying to carve out a role for AADC is that it expects to be “first on the scene when the crisis begins,” said Pedersen. The AADC system can be operated by the ship force, organically. A reserve team of about 33 people would be sent onboard the cruiser to augment the force. “Once you enter crisis support mode, the cruiser would support the joint task force commander,” he explained. “AADC would transition capability ashore for joint operations. A regional area defense commander would remain on the cruiser.”

AADC has encountered “challenges in development,” said Pedersen, because of the various concepts of warfare “shaped uniquely by the services, independently, for air defense. The AADC operators would be coordinating defensive roles, for example, for the Army’s Patriot and theater area (THAAD) anti-missile systems. “We also are working the air defense picture against cruise missiles and manned aircraft,” said Pedersen. “Our vision is to bring all that together to fight the area defense battle, so sensors and weapons can be coordinated.”

The prime contractor for AADC, General Dynamics Advanced Technology Systems, received an award last July for engineering and manufacturing development work.

Pedersen touted the system’s ability to model scenarios and run war games. “We can never fully predict what the enemy will do, but by running multiple scenarios against the same plan, it allows us to see what would happen if the enemy changes its forces.

“We do ‘what if’ analysis,” he explained. The system “allows you to do that multiple times, based on different priorities and asset formation. In the past, with pencil and paper, the planners could do one, two or three at best. With this system, they can run 10 options in a matter of minutes. A warfare commander can see up to 100 runs against a plan, or against two or three plans, and choose one to best protect the forces.”

The subcontractor responsible for the modeling and simulation technology in AADC is Science Applications International Corp. Inc. (SAIC), in Arlington, Va. The company’s contract is for 48 months.

Tom Schooley, program engineer at SAIC, said there are several areas where models and simulations will be used. “Models and sims look at the optimal way to position the forces to best defend the assets,” he said in a recent interview.

AADC largely will rely on existing force-on-force simulations that the military services have been using for some time, said Schooley. The commander will have a “dynamic re-planning,” capability so that he can change the makeup of the friendly forces in response to enemy movements.

“One of the challenges of this program is to figure out how to incorporate the real-time activities,” said Schooley. “It’s something we have had to do manually for years.”

The current AADC prototypes, he said, “didn’t take a hard look at the modeling and simulation arena. ... There will be a lot of [integration] challenges with the services. ... The services have to develop concepts and tactics.”

Schooley believes AADC could achieve a basic air defense plan “in a couple of hours. Adjustments to the plan can be made in minutes.”

The system’s end product is a “real plan that provides,” he said, “not only maps and overlays and pictures, but also detailed information that establishes priorities and rules of engagement.”